

(PCT Article 36 and Rule 70)

Date of submission of the demand	Date of completion of this report
Name and mailing address of the IPEA/EP	Authorized officer
Facsimile No.	Telephone No.

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.

PCT/FR2004/002945

## Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language \_\_\_\_\_, which is the language of a translation furnished for the purposes of:
- ☐ international search (Rule 12.3 and 23.1(b))
- ☐ publication of the international application (Rule 12.4)
- ☐ international preliminary examination (Rule 55.2 and/or 55.3)
2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:
- ☐ the international application as originally filed/furnished
- ☒ the description:
- pages 1-12 \_\_\_\_\_ as originally filed/furnished
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- ☒ the claims:
- nos. \_\_\_\_\_ as originally filed/furnished
- nos.\* \_\_\_\_\_ as amended (together with any statement) under Article 19
- nos.\* 1-19 \_\_\_\_\_ received by this Authority on 13.04.2006 with letter of 10.04.2006
- nos.\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- ☒ the drawings:
- sheets 1/5-5/5 \_\_\_\_\_ as originally filed/furnished
- sheets\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- sheets\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_
- ☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, nos. \_\_\_\_\_
- ☐ the drawings, sheets/figs \_\_\_\_\_
- ☐ the sequence listing (*specify*): \_\_\_\_\_
- ☐ any table(s) related to sequence listing (*specify*): \_\_\_\_\_
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, nos. \_\_\_\_\_
- ☐ the drawings, sheets/figs \_\_\_\_\_
- ☐ the sequence listing (*specify*): \_\_\_\_\_
- ☐ any table(s) related to sequence listing (*specify*): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

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Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement		
1.	Statement		
	Novelty (N)	Claims <u>1-19</u>	YES
		Claims _____	NO
	Inventive step (IS)	Claims <u>1-19</u>	YES
		Claims _____	NO
	Industrial applicability (IA)	Claims <u>1-19</u>	YES
		Claims _____	NO
2.	Citations and explanations (Rule 70.7)		
	<p>In the present report, reference is made to the following documents:</p> <p>D1: GB 2 372 645</p> <p>D2: US 5 880 575</p>		
	<p><b>1. Novelty</b></p> <p>A balanced charging method for charging n cells, where <math>n \geq 2</math>, constituting a lithium-ion or lithium polymer battery and connected in series, such that each cell consists of one element or a plurality of elements connected in parallel, which method is characterised in that it consists in continuously monitoring, from the start of the battery charging operation and throughout the performance thereof, the charging level of the various cells and, depending on the preliminary assessment of said charging levels, either charging all the cells uniformly or balancing said charging levels of said cells by supplying them differentially depending on their current charging levels, and in that it consists in triggering, for each cell of the battery, sequentially one after the other, for a fraction of the total charging time of the battery, sequences including an updated</p>		

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Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability;  
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assessment of the charging level of the cell under consideration, followed, depending on the charging level thereof and relative to all the charging levels of the other cells of the battery, by uniformly or differentially supplying power, according to a repetitive cycle throughout the charging operation; is not described in any of the cited documents. The subject matter of claim 1 is therefore novel (PCT Article 33(2)).

A device characterised in that it essentially consists, firstly, of a set of voltage measurement modules each of which is associated with one of the series cells forming the battery and measuring the voltages on the terminals of said cells, secondly, of a plurality of branch circuits each of which is connected in parallel to the terminals of a corresponding cell and can be selectively opened and closed and, finally, of a digital processing and operation management unit that receives measurement signals from said set of voltage measurement modules and controls the state [closed/open] of each branch circuit; such that each branch circuit (4) includes a commutation unit forming a switch and of which the state is controlled by the digital processing unit and, if required, at least one electrical power dissipating component, such as for example one or more resistors; is not described in any of the cited documents. The subject matter of claim 17 is therefore novel (PCT Article 33(2)).

## 2. Inventive step

D1, which is considered to be the prior art closest to

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	<p>the subject matter of claim 1, describes a balanced charging method for charging <math>n</math> cells, where <math>n \geq 2</math>, constituting a lithium-ion or lithium polymer battery and connected in series, such that each cell consists of one element or a plurality of elements connected in parallel. Consequently, the subject matter of claims 1 and 17 differs from D1 or D2 in that the method further consists in triggering, for each cell of the battery, sequentially one after the other, for a fraction of the total charging time of the battery, sequences including an updated assessment of the charging level of the cell under consideration, followed, depending on the charging level thereof and relative to all the charging levels of the other cells of the battery, by uniformly or differentially supplying power, according to a repetitive cycle throughout the charging operation.</p> <p>The problem that the present invention is intended to solve can be considered to be that of providing an optimised charging method (cf. description, page 3, lines 26 to 27).</p> <p>Taking D1 as the starting point, it is not obvious for a person skilled in the art to propose a method consisting, <i>inter alia</i>, in triggering, for each cell of the battery, sequentially one after the other, for a fraction of the total charging time of the battery, sequences including an updated assessment of the charging level of the cell under consideration, followed, depending on the charging level thereof and relative to all the charging levels of the other cells of the battery, by uniformly or differentially supplying power, according to a repetitive cycle throughout the charging operation, and arrive at</p>

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the invention, since said invention is not public knowledge and is not suggested in any of the cited documents.

Consequently, the subject matter of claims 1 and 17 is considered to involve an inventive step as defined by PCT Article 33(3).

The subject matter of claims 2 to 16 and 19 is novel and involves an inventive step.

Said claims therefore meet the requirements of PCT Article 33(1), 33(2) and 33(3).

**3. Industrial applicability**

The claimed subject matter is considered industrially applicable and thus meets the requirements of PCT Article 33(4).